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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,311	11/24/2003	Chien-Jung Sun	10113261	4289
34283	7590	01/05/2006	EXAMINER	
QUINTERO LAW OFFICE 1617 BROADWAY, 3RD FLOOR SANTA MONICA, CA 90404			CHEN, KIN-CHAN	
			ART UNIT	PAPER NUMBER
			1765	
DATE MAILED: 01/05/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/720,311

Applicant(s)

SUN ET AL.

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-9 and 16-29 is/are allowed.
- 6) ☒ Claim(s) 10-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 10-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tews et al. (US 6,534,376; hereinafter "Tews") in view of Lim et al. (US 6,828,185; hereinafter "Lim") as evidenced by Hsu et al. (US 6,143,645).

In a method for forming a deep trench for a semiconductor memory cell, Tews teaches that a semiconductor substrate may be provided with a trench having a pad stack layer thereon. The lower portion of the trench may be filled with a mask layer (such as a photoresist material; claim 10). Nitridation may be applied to form a sidewall nitride layer on the trench sidewall. The mask layer may be removed and the lower portion of the trench may be etched to form a bottle-shaped trench (col. 4, line 37 through col. 5, line 12; col. 5, lines 36-46; col. 6, lines 5-10). The disclosure of Tews is not limited to any particular nitridation. It is conventional to use plasma nitridation to form a nitride as a passivation /protection layer. Lim is only relied to show the conventional plasma nitridation (col. 8, lines 23-31), also see Hsu et al. (US 6,143,645;

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col. 4, lines 51-59) as evidence. Because it is conventional method and because it is disclosed by Lim, hence, it would have been obvious to one with ordinary skill in the art to use plasma nitridation as taught by Lim in the process of Tews in order to form a passivation /protection layer.

As to claim 10, Lim teaches the claimed temperatures for plasma nitridation (col. 8, lines 23-31).

As to dependent claim 13, the pressure is known to be a result-effective variable and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different pressures) to obtain optimal result with a reasonable expectation of success.

As to dependent claim 14, Lim teaches using RF plasma (col. 8, lines 23-31).

As to dependent claim 15, Lim teaches the claimed RF power for plasma nitridation (col. 8, lines 23-31).

The above-cited claims differ from the prior art by specifying well-known features (such as etching the trench by wet etching in claim 11; etching solution may be ammonia in claim 12) to the art of semiconductor device fabrication, the examiner takes official notice. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify the prior art by adding any of same well-known features to same in order to provide their art recognized

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advantages and produce an expected result with a reasonable expectation of success.

The examiner takes official notice of facts that applicant did not traverse the aforementioned conventionality (e.g., well-known features, common knowledge), which have been stated in the previous office action (August 29, 2005).

### ***Allowable Subject Matter***

3. Claims 1-9, 16-29 are allowed.

### ***Response to Arguments***

4. Applicant's arguments filed November 25, 2005 with respect to claims 10-15 have been fully considered but they are not persuasive. Applicant has argued that prior art does not teach filling a photoresist layer into the lower portion of the trench; plasma nitriding sidewall of the trench of the substrate to form a sidewall nitride layer on the pad stack and the trench sidewall; removing the photoresist layer; etching the lower portion of the trench to form a bottle-shaped trench. It is not correct. As has been stated in the office action, the process steps of prior art **comprise** said limitations, in particular, see Fig.5 of Tews for "filling a photoresist layer into the lower portion of the trench"; see Fig.7 (col. 5, lines 36-47) of Tews and Lim for "plasma nitriding sidewall of the trench of the substrate to form a sidewall nitride layer on the pad stack and the trench sidewall";

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Fig. 6 for "removing the photoresist layer"; see Fig.11 for etching the lower portion of the trench to form a bottle-shaped trench.

### ***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hsu et al. (US 6,143,645; col. 4, lines 51-59) teaches using plasma nitridation to form a passivation layer.

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

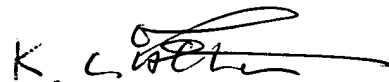
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-

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1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*December 22, 2005*



Kin-Chan Chen  
Primary Examiner  
Art Unit 1765